

# Once is Not Enough

## A Guide to Water Reuse in Massachusetts



495/MetroWest Corridor Partnership  
Metropolitan Area Planning Council





# Outline



- Issue Background
- Types of Uses & Case Studies
  - Commercial Reuse
  - Industrial Reuse
  - Groundwater Recharge
  - Agricultural Reuse
  - Environmental and Recreational Reuse
- Technical Issues and Cost-Benefit Considerations
- Regulatory Overview
- Recommendations

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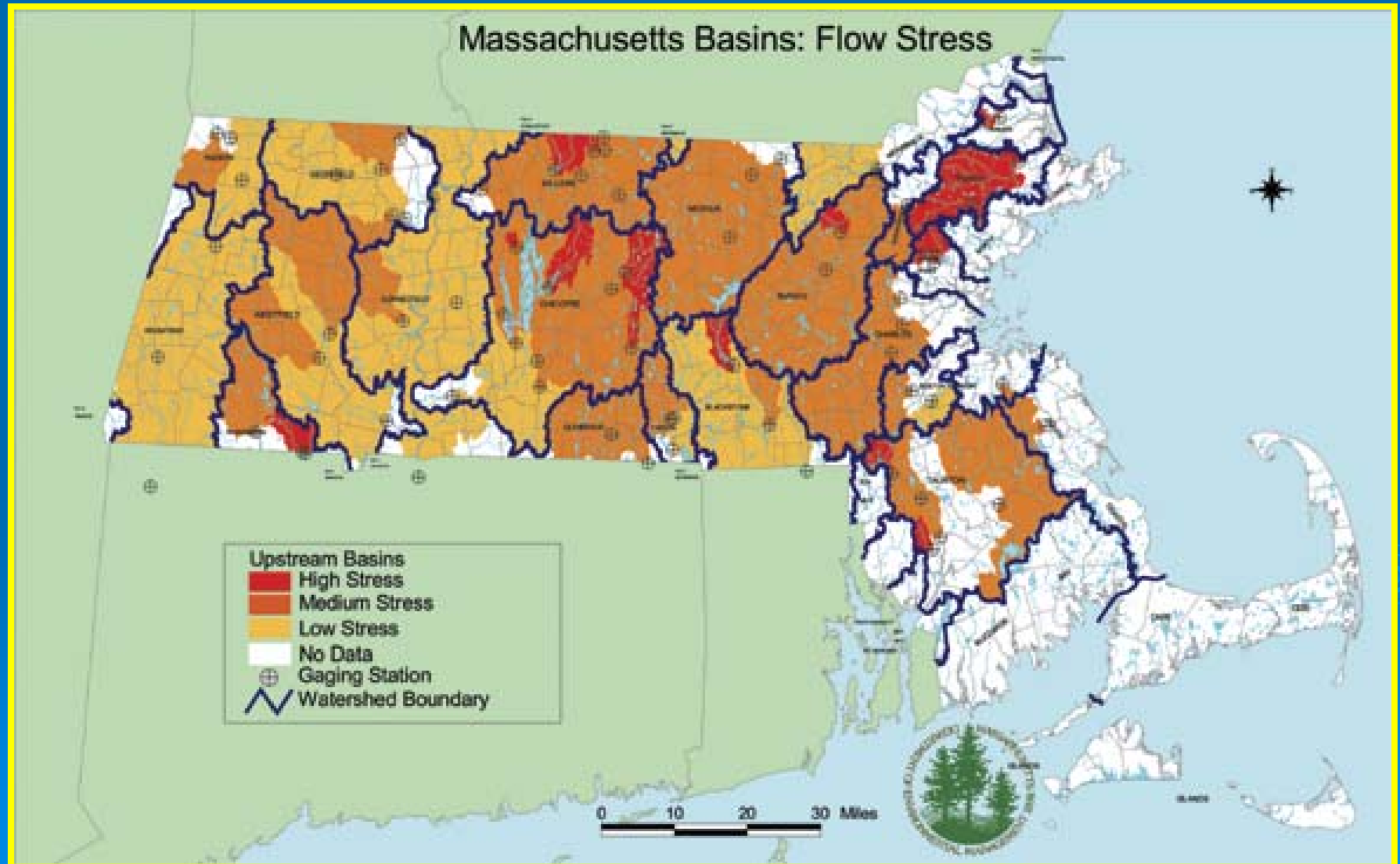


# Massachusetts Water Use Background



- With 44" of precipitation per year, why does Massachusetts need to worry about water?
  - Limited aquifer storage statewide
  - Impervious surfaces reduce aquifer recharge; piping of stormwater carries rainwater away
  - Seasonal demand prevents full aquifer recharge
  - Development on poor soils requires sewers and outside water sources

# Water Supplies in Massachusetts: Stressed Basins





# Water Use by Purpose

Do all uses require drinking-quality water?

Nationally:

- 32% agricultural, recreational, commercial, and industrial use
- 28% toilet flushing
- 23% bathing
- 14% for laundry and dishwashing
- 3% drinking and cooking



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# Water Reuse

- Water reuse means using treated wastewater, also known as recycled or reclaimed water, to satisfy certain water demands that do not require potable water
- Benefits of water reuse include:
  - Non-potable water supply in stressed basins
  - Wastewater disposal option
  - Cost-effective supply for some high-demand industrial users
  - Reduced impacts of large developments
  - Less fresh water diversion from sensitive ecosystems
  - Less treated wastewater discharges into sensitive water bodies
  - Creation or enhancement of wetlands



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# Allowable Uses in Massachusetts



- Golf courses – spray irrigation
- Landscaping – nurseries
- Toilet flushing in commercial applications
- Artificially recharging aquifers



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# Types of Uses



- Commercial Reuse
- Industrial Reuse
- Groundwater Recharge
- Agricultural Reuse
- Environmental and Recreational Reuse

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# Commercial Reuse



- Types of commercial reuse include:
  - Irrigation
  - Toilet flushing
  - Vehicle washing
  - Fountains, reflecting pools, waterfalls
  - Dust control & concrete production
  - Fire protection

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# Commercial Reuse

- Issues with Commercial Reuse:
  - Additional treatment beyond standard wastewater treatment
  - Possible on-site storage of recycled water
  - Dual distribution system
  - Demand evaluation
  - Clear signs for above ground facilities
  - Plant impacts from reclaimed water irrigation

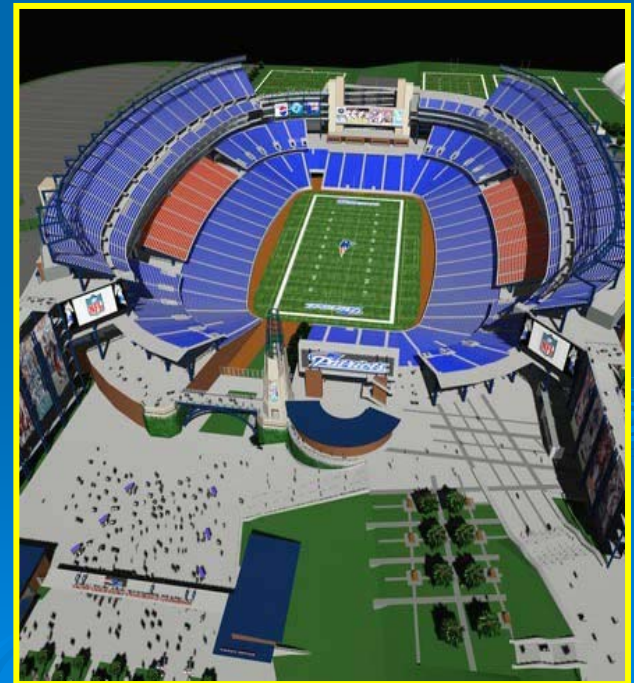




# Commercial Reuse, Massachusetts Case Study Gillette Stadium - Foxborough, MA



- Background: New stadium in 2002 in Foxborough
- Water issue: Would have overwhelmed town with potable water demand and wastewater flow
- Solution:
  - 1 million gallon elevated holding tank for potable water
  - Wastewater treatment plant with subsurface disposal to recharge aquifers
  - 60% of treated wastewater used for toilet flushing in the facility



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# Industrial Reuse

- Types of industrial reuse:
  - Cooling water
  - Industrial processing water
- Main industrial users of recycled water:
  - Utility power plants
  - Metal working facilities
  - Paper mills
  - Textile industry
  - Tanneries







# Industrial Reuse

- Issues with industrial reuse:
  - Potential for corrosion, biological growth, scaling due to higher concentrations of contaminants
  - Different industrial processes require different levels of water quality

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# Industrial Reuse, Massachusetts Case Study: EMC, Hopkinton



- Background: EMC planned to add two new large engineering facilities in Hopkinton
- Water issues:
  - Water shortages in Hopkinton during summer months
  - EMC Hopkinton's largest water user
- Solution:
  - Self-distributed wastewater treatment and recycling plant
  - Plant treats 32,000 gpd
  - 11,000 gpd reused
- Reclaimed Water: 95% toilets, 5% cooling





# Groundwater Recharge Reuse



## ➤ Benefits:

- Prevents saltwater intrusion in coastal aquifers
- Provides treatment and storage for future water reuse
- Supplements existing potable or non-potable water supplies
- Controls or prevents groundwater subsidence

## ➤ Issues with groundwater recharge:

- Land requirements
- Cost
- Possible aquifer contamination
- Groundwater law liability

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# Groundwater Recharge Massachusetts Case Study: Kingston, MA



- Background: Development pressure increases with rail service to Boston
- Water issues:
  - Failing septic systems threaten water quality in Jones River and Kingston Bay
  - Town wells overdrawn in summer
  - Need wastewater treatment plan and sewers
- Solution:
  - Treated effluent for irrigation at proposed golf course
  - Subsurface leaching fields to recharge aquifers





# Agricultural Water Reuse



- Irrigation for agriculture accounts for 75% of all water use worldwide
- Studies show reclaimed water safe for irrigation
- Crop yields increased by nutrients in reclaimed water
- Issues with agricultural reuse:
  - Crop damage from increased salinity, chlorine & trace elements
  - Runoff issues
  - Groundwater monitoring may be required

# Environmental and Recreational Reuse

## ➤ Types of Environmental and Recreational Reuse

- Wetlands restoration
- Constructed wetlands
- Stream augmentation
- Water features
- Water impoundments for boating, wading, and swimming



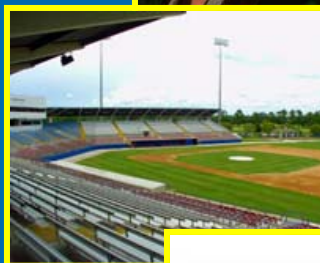
## ➤ Issues with constructed wetlands reuse:

- Significant land use requirements
- Limited application in urban settings

# Potential New Uses

## ➤ Irrigation

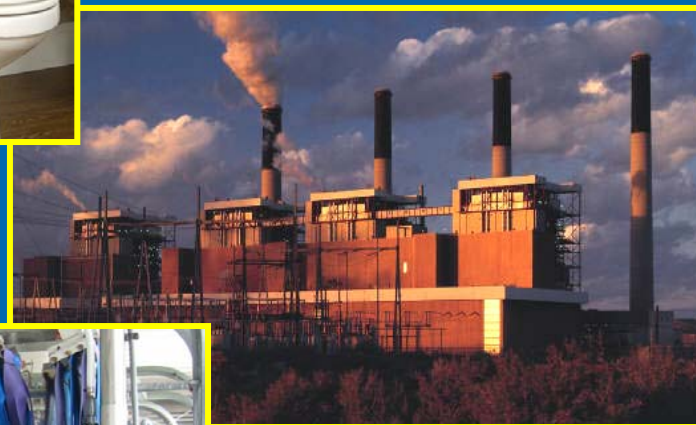
- Parks
- Ball Fields
- Cemeteries
- Developments
- Crops
- Residential irrigation



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# Potential New Uses

- Toilet reuse
  - Condos
  - Apartments
- Fire protection
- Powerplants
- Industrial uses
- Automated car wash



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# Water Reuse Technical Issues

- Issues to consider in planning:
  - Identify demand for reclaimed water
  - Determine existing sources of reclaimed water
  - Investigate level of treatment necessary for intended use
  - Estimate storage capacity to meet seasonal demand
  - Determine needed supplemental facilities
  - Evaluate environmental impacts
  - Incorporate operation & maintenance skills



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# The Benefits vs. Challenges



## Benefits

- Provides a safe and affordable alternative water source
- Reduces demand on potable water supplies

## Challenges

- Added capital costs
  - Additional treatment
  - Reuse water storage
  - Distribution system
- Added O&M costs
- Public perception

# Water Reuse Costs

- Water reuse cost issues:
  - Capital improvements at wastewater treatment plant
  - Installation of reclaimed water transmission lines
  - O&M costs for power, water quality monitoring, and administration
  - Cross-connections prevention program
  - Revenue loss for potable water supplier



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# Constraints & Barriers



- MA plumbing code
- Lack of coordinated local water/wastewater planning
- Regulatory inconsistency at municipal level
- Local zoning not required to comply with community development plans
- No-growth advocates may oppose any additional water supply
- Lack of public education for town officials & residents





# Recommendations

- State should work with communities to promote reclaimed water projects
- Minimum water reuse thresholds for developments on state property or using state funds
- Public education campaign
- Technical assistance for communities
- Formation of regional water use districts
- Reuse standards & cost-benefit analysis in MEPA review



# ***A Guide to Water Reuse in Massachusetts***

Copies are available from MAPC and the  
495/MetroWest Corridor Partnership

Available online at:

[www.mapc.org/waterreuse](http://www.mapc.org/waterreuse) and  
[www.arc-of-innovation.org](http://www.arc-of-innovation.org)

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